

# THE MERCK INDEX

AN ENCYCLOPEDIA OF  
CHEMICALS AND DRUGS

NINTH EDITION

Martha Windholz, *Editor*  
Susan Budavari, *Associate Editor*  
Lorraine Y. Stroumtsos, *Assistant Editor*  
Margaret Noether Fertig, *Assistant Editor*

*Published by*  
**MERCK & CO., INC.**  
RAHWAY, N.J., U.S.A.

1976

**BEST AVAILABLE COPY**

**Merck & Co., Inc.**

Rahway, New Jersey, U.S.A.

MERCK SHARP & DOHME

West Point, Pa.

MERCK SHARP & DOHME INTERNATIONAL

Rahway, N. J.

MERCK SHARP & DOHME RESEARCH LABORATORIES

Rahway, N. J. / West Point, Pa.

MSD AGVET DIVISION

Rahway, N. J.

HUBBARD FARMS, INC.

Walpole, N. H.

MERCK CHEMICAL MANUFACTURING DIVISION

Rahway, N. J.

MERCK CHEMICAL DIVISION

Rahway, N. J.

ALGINATE INDUSTRIES LIMITED

London, England

BALTIMORE AIRCOIL COMPANY, INC.

Baltimore, Md.

CALGON CORPORATION

Pittsburgh, Pa.

KELCO DIVISION

San Diego, Calif.

---

1st Edition—1889

2nd Edition—1896

3rd Edition—1907

4th Edition—1930

5th Edition—1940

6th Edition—1952

7th Edition—1960

8th Edition—1968

9th Edition—1976

---

First Printing, October 1976

Second Printing, March 1977

Third Printing, May 1978

Fourth Printing, July 1979

Fifth Printing, April 1980

Sixth Printing, May 1981

Copyright © 1976 by Merck & Co., Inc.

Previous Editions

Copyright © 1940, 1952, 1960, 1968 by Merck & Co., Inc.

All rights reserved. Copyright under the Universal  
Copyright Convention and the International Copyright  
Convention. Copyright reserved under the Pan-American  
Copyright Convention.

Library of Congress Catalog

Card Number 76-27231

ISBN Number 911910-26-3

Printed in the U. S. A.

**BEST AVAILABLE COPY**

Wh  
betica  
evolut  
has de  
encycl

As  
to fulf  
pharm  
proper  
names  
the ph  
succin  
toxicit

Eac  
the ne  
plexity  
and pr  
tually  
chemic  
for inc  
limitat

The  
in the  
time-co  
to deve  
of new  
monog  
correct  
were g  
section

Muc  
Index v  
been re  
more fr

The  
in writi  
that the  
source

c. 76, 639 (1954). Exists in and  $\gamma$ -: Iitaka, *Nature* 183,

n alc, starts to dec at 233°, 1.1607.  $pK_1$  2.34;  $pK_2$  12.0. Adsorption on Grettie, Williams, *J. Am. Chem. Soc.* 77, 25.0 in 100 ml water at 25°. 25.0 at 100°: 67.2 g. 100 g of abs 164 parts pyridine. Almost

hygroscopic prisms from HCl, mp 189°. *ium glycinate*.

(amide, 2-Amino-N,N-bis(2-chloroethyl)glycinamide,  $N_2O_4$ ; mol wt 199.10. C 14.07%, O 8.04%. Prepn: *Chim. Khim.* 31, 1193 (1961); *man, Chem. & Ind. (Lon-*

$2CH_2Cl$

$2CH_2Cl$

ICI, crystals from alc, mp

cine sulfate.  $C_8H_{11}N_3O_8S$ ; 7%, N 13.00%, O 49.49%, S 37.51%. Prepn: Horsford, *Ann. Miller, Remeika, Phys. Rev.* 9, 73 and 125-129 (1959). *ely sol in water. Has fer-* 47°. Spontaneous polari- 4 coul/cm<sup>2</sup>. Coercive field

1 constituent of soybeans: *em. Soc.* 20, 419 (1898); 1282 (1939). *Review: H. oteins vol. I, Part A (Aca-* 208-209, 223; *eidem, ibid.* 16.

ge 1-4, as well as above 7. *droxyacetylaminophenyl]- o(hydrogen N-glycolylars- oylarsanilate; bismuth p- smuth glycolyl arsanilate; deriv: Broxolin; Dysentu- C\_4H\_9AsBiNO\_6*; mol wt 451.01, Bi 41.88%, N 15.01%, As 13.01%, O 30.11%. *ndb. Pharm. Praxis Band I*

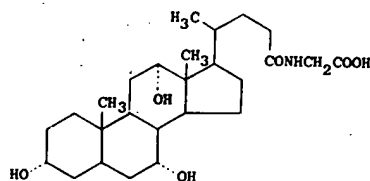
H

(i=O

on heating. Very slightly insol in ether, chloroform, 3.5. (Additional bismuth) is de Mexico].

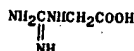
niasis.

**4330. Glycocholic Acid.** *N*-[3 $\alpha$ ,7 $\alpha$ ,12 $\alpha$ -trihydroxy-24-oxocholan-24-yl]glycine; *N*-cholyglycine.  $C_{30}H_{53}NO_6$ ; mol wt 465.61. C 67.06%, H 9.31%, N 3.01%, O 20.62%. The product of conjugation of cholic acid with glycine; chief ingredient of the bile of herbivorous animals. In the weakly alkaline bile fluid glycocholic acid exists as the sodium salt. Prepn from bile: Hammarsten in *Abderhalden's Handbuch der Biol. Arbeitsmethoden*, Abt. I, Teil 6, p 211 (1925). Prepn from cholic acid: Cortese, *J. Am. Chem. Soc.* 59, 2532 (1937). Synthesis: Cortese, Bauman, *ibid.* 57, 1393 (1935); Bergstrom, Norman, *Acta Chem. Scand.* 7, 1126 (1953). Separation: Antonides, Brit. pat. 928,635 (1963 to Armour). Metabolism: Norman, *Scand. J. Gastroenterol.* 5, 231 (1970).



Sesquihydrate, crystals from 5% alc, mp about 130°.  $[\alpha]_D^{25} +30.8^\circ$  ( $c = 7.5$  in 95% ethanol). Anhydr form, mp 165-168°.  $pK_1$  4.4. Soly in water at 15°: 0.33 g/l; in boiling water: 8.3 g/l. Is hydrolyzed to cholic acid and glycine by acids and alkalis. Forms addition compds with nitrobenzene, aniline, benzyl alcohol, benzaldehyde, triolein. Sodium salt,  $C_{30}H_{51}NNaO_6$ , crystals from 95% alcohol + ether, mp 230-240°.  $[\alpha]_D^{25} +32^\circ$  (water). Soly at 15° in water > 274 g/l; in alcohol > 340 g/l.

**4331. Glycocyamine.** *N*-(Aminoiminomethyl)glycine; *N*-amidinoglycine; guanidineacetic acid; guanidoacetic acid.  $C_3H_7N_3O_2$ ; mol wt 117.11. C 30.77%, H 6.03%, N 35.88%, O 27.33%. Prepn from *S*-ethylthiourea hydrobromide, sodium hydroxide, and glycine: Brand, Brand, *Org. Syn. coll. vol. III*, 440 (1955). Crystal and molecular structure: Guha, *Acta Cryst.* 29B, 2163 (1973).



Crystals, dec 280-284°. Appreciably sol in water. THERAP CAT: In combination with betaine as cardiotonic.

**4332. Glycofurool.**  $\alpha$ -(Tetrahydrofuran-2-yl)- $\omega$ -hydroxy- $\beta$ -hydroxy-1,2-ethanediyl. Described as tetrahydrofurfuryl alcohol polyethylene glycol ether with an average of two ethylene glycol groups. Commercial development: Hoffmann-La Roche. Liquid.  $d_4^{20}$  1.078-1.080.  $bp_{760}$  155° (max). Miscible with water. Soluble in ether, ethanol, propanol, glycerol. Practically insol in petr ether, isopropyl ether. Good solvent for many drugs. Injectability and low toxicity are claimed: Spiegelberg *et al.*, *Arzneimittel-Forsch.* 6, 75 (1956).

**4333. Glycogen.** Animal starch; liver starch.  $(C_6H_{10}O_5)_n$ ; mol wt from about  $2.7 \times 10^5$  to  $3.5 \times 10^6$ . Reserve carbohydrate of the animal organism. High molecular wt polymer having branched-chain structure composed of D-glucopyranose residues. Distributed through the cell protoplasm. Found esp in the liver and in rested muscle. Occurs also in insects and lower plants including fungi and yeasts. Isolated by alkaline destruction of the other cell constituents: Claude Bernard, *Lecons sur le diabete* (Paris, 1877) p 553; by destruction with trichloroacetic acid: Bell, Young, *Biochem. J.* 28, 882 (1934); by centrifugation: Meyer, Jeanloz, *Advan. Enzymol.* 3, 112 (1943); by hydraulic pressure: Stockhausen, Silberstein, *Biochem. Z.* 287, 276 (1936). For biological synthesis and lysis from the Cori ester (glucose-1-phosphate) see the review and bibliography by Meyer, *Advan. Enzymol.* 3, 109 (1943); see also Nord, *Chem. Rev.* 26, 423 (1940); Kalkar, *ibid.* 28, 71 (1941). Isolated from the causal agent of cotton root rot, *Phymatotrichum omnivorum* (Shear) Duggar: Ergle, *J. Am. Chem. Soc.* 69, 2061 (1947). Studies on linkages: Bahl, Smith, *J. Org. Chem.* 31, 2915 (1966).

White powder.  $[\alpha]_D^{25} +196^\circ$  to  $+197^\circ$ . Sol in water with opalescence. Insol in alc. Does not reduce Fehling's soln. With iodine, brown to violet colors are produced.

**4334. Glycol Dilaurate.** *Dodecanoic acid 1,2-ethanediyl ester*; ethylene dilaurate.  $C_{26}H_{50}O_4$ ; mol wt 426.66. C 73.19%, H 11.81%, O 15.00%.  $C_{11}H_{23}COOCH_2CH_2OOC-C_{11}H_{23}$ . Colorless, amorphous mass, mp 50-52°.  $bp_{760}$  188°. Insol in alcohol, ether.

USE: In lacquers and varnishes as a plasticizer.

**4335. Glycolic Acid.** *Hydroxyacetic acid*; hydroxyethanoic acid.  $C_2H_4O_3$ ; mol wt 76.05. C 31.58%, H 5.30%, O 63.11%.  $HOCH_2COOH$ . Constituent of sugar cane juice. Made by the action of NaOH on monochloroacetic acid; also by electrolytic reduction of oxalic acid. *Review: Sales brochure on hydroxyacetic acid from E. I. du Pont.*

Odorless, somewhat hygroscopic crystals, mp 80°.  $K$  at 25°:  $1.48 \times 10^{-4}$ . Soluble in water, methanol, alcohol, acetone, acetic acid, ether. pH of aq solns: 2.5 (0.5%); 2.33 (1.0%); 2.16 (2.0%); 1.91 (5.0%); 1.73 (10.0%). LD i.v. in cats: 1.0 g/kg. Riker, Gold, *J. Am. Pharm. Assoc.* 31, 306 (1942).

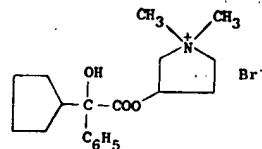
USE: In the processing of textiles, leather, and metals; in pH control, and wherever a cheap organic acid is needed, e.g. in the manuf of adhesives, in copper brightening, decontamination cleaning, dyeing, electroplating, in pickling, cleaning and chemical milling of metals. *Caution: Mild irritant to skin, mucous membranes.*

**4336. Glycol Salicylate.** 2-Hydroxybenzoic acid 2-hydroxyethyl ester; monoglycol salicylate; ethylene glycol monosalicylate; 2-hydroxyethyl salicylate; GL-7; Glysal; Spirosal.  $C_9H_{10}O_4$ ; mol wt 182.17. C 59.33%, H 5.53%, O 35.13%.  $C_6H_4(OH)COOCH_2CH_2OH$ .

Almost colorless, odorless liq.  $bp_{12}$  169-172°. Soluble in about 110 parts water, 8 parts olive oil; very sol in alcohol, benzene, chloroform, ether.

THERAP CAT: Counterirritant, antirheumatic.

**4337. Glycopyrrolate.** 3-[(Cyclopentylhydroxyphenylacetate)-1,1-dimethylpyrrolidinium bromide; 3-hydroxy-1,1-dimethylpyrrolidinium bromide  $\alpha$ -cyclopentylmandelate;  $\alpha$ -cyclopentylmandelic acid ester with 3-hydroxy-1,1-dimethylpyrrolidinium bromide; 1-methyl-3-pyrrolidyl  $\alpha$ -cyclopentylmandelate methobromide; 1-methyl-3-pyrrolidyl  $\alpha$ -phenyl- $\alpha$ -cyclopentylglycolate methobromide; 3-(2-phenyl-2-cyclopentylglycoloxy)-1,1-dimethylpyrrolidinium bromide; AHR 504; Nodapton; Robanul; Robinul; Tarodyl; Tarodyn.  $C_{25}H_{37}BrNO_4$ ; mol wt 398.36. C 57.29%, H 7.08%, Br 20.06%, N 3.52%, O 12.05%. Prepn: Franko, Lunsford, *J. Med. Pharm. Chem.* 2, 523 (1960); Lunford, U.S. pat. 2,956,062 (1960 to A. H. Robins).



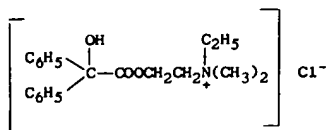
Crystals from butanone, mp 193.2-194.5°. THERAP CAT: Anticholinergic.

**4338. Glycosine.** 1-Methyl-2-(phenylmethyl)-4(1H)-quinazolinone; 2-benzyl-1-methylquinazolin-4-one; arborine.  $C_{18}H_{16}N_2O$ ; mol wt 250.29. C 76.78%, H 5.64%, N 11.19%, O 6.39%. Found in the toothbrush plant, *Glycosmis pentaphylla* (Retz.) Corr., and *G. arborea* Corr., Rutaceae. Isolated from dried, powdered leaves: Chatterjee, Majumdar, *J. Am. Chem. Soc.* 76, 2459 (1954). Identity of arborine and glycosine, structure: Chakravarti *et al.*, *Tetrahedron* 16, 224 (1961). Synthesis: Pakrashi *et al.*, *Indian J. Chem.* 6, 472 (1968); Ziegler *et al.*, *Monatsh.* 100, 948 (1969).

Consult the cross index before using this section.

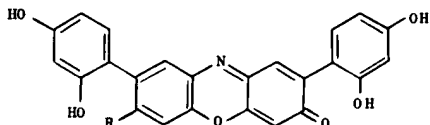
## L

**5180. Lachesine.** *N*-Ethyl-2-[(hydroxydiphenylacetyl)-oxy]-*N,N*-dimethylethanaminium chloride; ethyl(2-hydroxyethyl)dimethylammonium chloride benzilate; E-3.  $C_{20}H_{28}ClNO$ ; mol wt 363.90. C 66.01%, H 7.20%, Cl 9.74%, N 3.85%, O 13.19%. Prepn: Ford-Moore, Ing, *J. Chem. Soc.* 1947, 55.



Crystals from ethanol + acetone, mp 213°. LD<sub>50</sub> in mice: 0.8 mg/20 g i.p.; 3.2 mg/20 g s.c.; 20.0 mg/20 g orally. THERAP CAT: Mydriatic, cycloplegic.

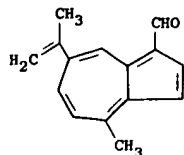
**5181. Lacmoid.** Resorcin blue; C.I. 51400. Prepd by heating on an oil bath at 110° a mixture of 100 parts resorcinol, 5 parts sodium nitrite and 5 parts water. An exothermic reaction ensues which brings the temp to 120°. After the evolution of ammonia has ceased, the mixt. is brought in soln with water. A precipitate is obtained upon the addition of HCl. This is filtered off and washed with water: Traub, Hock, *Ber.* 17, 2615 (1884). Constituents: About 50% unchanged resorcinol, and a mixture of two dyes of the structure given: R is OH and NH<sub>2</sub>. Details: Musso *et al.* *Angew. Chem.* 73, 434 (1961).



Dark-violet, lustrous scales or granules. Freely sol in methanol, ethanol, amyl alcohol, glacial acetic acid, acetone, phenol. Sparingly sol in water, ether. Practically insol in chloroform, benzene, petr ether.

USE: As acid-base indicator in 0.2% soln in alcohol. pH: 4.4 red; 6.4 blue. Satisfactory for titrating mineral acids, strong bases, many alkaloids; determining alkalinity and temporary hardness in water analysis. Not adapted for carbonates, weak inorganic and organic acids, weak bases. Lacmoid is more sensitive than litmus, particularly in form of test paper.

**5182. Lactarovioline.** 7-Isopropenyl-4-methyl-1-azulene-carboxaldehyde; 1-formyl-4-methyl-7-isopropenylazulene.  $C_{15}H_{14}O$ ; mol wt 210.26. C 85.68%, H 6.71%, O 7.61%. Antibiotic pigment produced by the fungus *Lactarius deliciosus*: Willstaedt, *Ber.* 68, 333 (1935); 69, 997 (1936); Benesová *et al.*, *Chem. Listy* 48, 882 (1954). Structure: Plattner *et al.*, *Chem. & Ind. (London)* 1954, 1202; Sorm *et al.*, *ibid.* 1511; Heilbron, Schmid, *Helv. Chem. Acta* 37, 2018 (1954).



Purple crystals from petr ether, mp 58°. Soluble in the usual organic solvents. Practically insoluble in water.

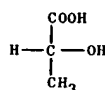
**5183. Lactate Dehydrogenase.** Lactic dehydrogenase; serum lactic dehydrogenase. Enzyme found in almost all animal tissues, in microorganisms, and in plants. Isolated from heart muscle, rat skeletal muscle, and Jensen sarcoma:

Straub, *Biochem. J.* 34, 483 (1940); Kubowitz, Ott, *Biochem. Z.* 314, 94 (1943); Meister, *Biochem. Prepn.* 2, 18 (1952). Catalyzes the equilibrium reaction of pyruvic acid to lactic acid. Plays an important role in the equilibrium of carbohydrate catabolism and anabolism. Used as fuel for aerobic tissues such as the heart. Structure is a tetramer of mol wt about 140,000. Consists of units of mol wt about 35,000. Two types of subunits are distinguishable: M (muscle) type and H (heart) type. Lactate dehydrogenases of heart and muscle are mainly H<sub>4</sub> and M<sub>4</sub>; all other possible hybrids have been found in various tissues. Elevations of lactate dehydrogenase activity have been found in myocardial infarction, hepatocellular necrosis, metastatic carcinoma, diabetic ketosis, sickle cell anemia, malignant lymphoma, infectious mononucleosis, and cerebral infarction: Standjord *et al.*, *J. Am. Med. Assoc.* 182, 1099 (1962). Comprehensive review: Everse, Kaplan, *Advan. Enzymol. Relat. Areas Mol. Biol.* 37, 61 (1973).

Solns in ammonium sulfate or phosphate buffer retain their activity for about 2 months.

USE: In the determination of pyruvate (used in conjunction with reduced coenzyme). In the diagnosis of myocardial infarction and leukemia.

**5184. D-Lactic Acid.** (*R*)-2-Hydroxypropanoic acid; D(-)-lactic acid; levorotatory lactic acid; *l*-lactic acid; D-Milchsäure (German).  $C_3H_5O_3$ ; mol wt 90.08. C 40.00%, H 6.71%, O 53.29%. Obtained by resolution of DL-lactic acid: Purdie, Walker, *J. Chem. Soc.* 61, 754 (1892); Borsook *et al.*, *J. Biol. Chem.* 102, 449 (1933). Convenient laboratory prepn from glucose using *Lactobacillus leichmannii*: Brin, *Biochem. Prepn.* 3, 61 (1953).



Crystals from ether + isopropyl ether, mp 52.8°.  $[\alpha]_D^{25}$  -2.6° (c = 8). pK = 3.83. Sol in water, alcohol, acetone, ether, glycerol. Practically insol in chloroform.

Forms salts with many metals. Most of these salts are dextrorotatory.

Zinc D(+)-lactate.  $Zn(C_3H_5O_3)_2 \cdot 2H_2O$ , crystals,  $[\alpha]_D^{25}$  +8.18° (c = 2.5).

**5185. DL-Lactic Acid.** 2-Hydroxypropanoic acid; racemic lactic acid; ordinary lactic acid;  $\alpha$ -hydroxypropionic acid; Milchsäure (German); Tonsillozan.  $C_3H_5O_3$ ; mol wt 90.08. C 40.00%, H 6.71%, O 53.29%. Occurs in sour milk as a result of lactic acid bacteria; also found in molasses due to partial conversion of sugars, in apples and other fruits, tomato juice, beer, wines, opium, ergot, foxglove, and several higher plants, especially during germination. Lactic acid is prepd technically by "lactic acid fermentation" of carbohydrates such as glucose, sucrose, lactose with *Bacillus acidilacti* or related organisms such as *Lactobacillus delbrueckii*, *L. bulgaricus* etc. The fermentation is carried out at relatively high temps. Produced commercially by fermentation of whey, cornstarch, potatoes, molasses. Review on the production of lactic acid by fermentation: S. C. Prescott, C. G. Dunn, *Industrial Microbiology* (McGraw-Hill, New York, 3rd ed., 1959) pp 304-331. Chem preps from acetaldehyde and CO in dil  $H_2SO_4$  at 130-200° and 900 atm: Loder, U.S. pat. 2,265,945 (1938 to du Pont); by hydrolysis of hexoses with NaOH: Lock, U.S. pat. 2,382,889 (1943). Prepn of crystalline lactic acid: Borsook *et al.*, *J. Biol. Chem.* 102, 449 (1933).



Crystals, mp 16.8°. bp<sub>14-15</sub> 122°; bp<sub>0.5-1</sub> 82-85°. K at 25°  $1.38 \times 10^{-4}$ . Heat of combustion at constant pressure 3615 cal/kg. Volatile with superheated steam. Sol in water, alc, furfural; less sol in ether. Practically insol in chloroform, petr ether, carbon disulfide. *Pharm. Incompat*: Oxidizing

agents, iodides, H<sub>2</sub>g/kg, Smyth *et al.* Barium salt,  $C_6H_5O_5$  Sol in water, Copper salt dithy to blue crystals. alcohol.

USE: In dyeing goods, solvent for induline, nigrosin-mordanting wool; beverages; for acid *Clostridium butyricum*, and decalcifying flux for soft solder products, in medicine the casting of phenol concd solns.

THERAP CAT: Acid. THERAP CAT (VET): solutions to irrigate antiferment.

**5186. L-Lactic Acid.** (+)-lactic acid; de sarcocollal acid; pascarsäure.  $C_3H_5O_3$ ; m 53.29%. Occurs in fluid of man and animal muscle and blood is also present in livotic fluid, and other: resolution of DL-lac: 61, 754 (1892); Bo (1933). Convenient mentation by *Lacti Prepn.* 3, 61 (1953). *ticus*: Andersen, G. Monograph: M. I Metabolism of L-an. vol. 119, art. 3, 851.

Crystals from acet +2.6° (c = 2.5). pl metals. The salts are racemic acid. Most

Zinc L(-)-lactate  $[\alpha]_D^{25}$  -8.2° (c = 2.5)

**5187. Lactic Acid.** 1-carboxyethyl ester hydroxypropanoylox 162.14. C 44.44%, lactic acid at 120° for (1925).

Pale yellow, clear, usual organic solvent: Methyl ester,  $C_7H_{12}$  281 (1945 to the peop USE: The methyl es

**5188. Lactide.** 2,5-dioxo-3,6-dimethyl-1,4-dioxane. ( 5.60%, O 44.40%. For in vacuo below 25 mm ters of acetylenic  $\gamma$ -g) (1952); U.S. pat. 2,66

owitz, Ott, *Bio-m. Prepn.* 2, 18 of pyruvic acid to equilibrium of used as fuel for is a tetramer of of mol wt about inguishable: M dehydrogenases all other possible Elevations of found in myocar-tastatic carcino-malignant lym-ebrial infarction: 99 (1962). Com-Enzymol. Relat.

ate buffer retain used in conjunc-tion of myocar-

propanoic acid; d; l-lactic acid; 0.08. C 40.00%, tion of DL-lactic (1892); Borsook nient laboratory ichmannii: Brin,

mp 52.8°. [ $\alpha$ ]<sub>D</sub><sup>25</sup> alcohol, acetone, orm. of these salts are y, crystals, [ $\alpha$ ]<sub>D</sub><sup>25</sup>

oic acid; racemic ypropionic acid; 3; mol wt 90.08. n sour milk as a molasses due to l other fruits, to-glove, and several n. Lactic acid is ion" of carbohy-ith *Bacillus acidilacillus delbrueckii*, ed out at relative-y fermentation of view on the pro- C. Prescott, C. G. Hill, New York, rom acetaldehyde atm: Loder, U.S. colysis of hexoses (1943). Prepn of *J. Chem.* 102, 449

agents, iodides, HNO<sub>3</sub>, albumin. LD<sub>50</sub> orally in rats: 3.73 g/kg, Smyth *et al.*, *J. Ind. Hyg. Toxicol.* 23, 259 (1941).

Barium salt, C<sub>6</sub>H<sub>10</sub>BaO<sub>6</sub>, *barium lactate*. Powder. *Poisonous!* Sol in water, dil alcohol.

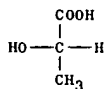
Copper salt dihydrate, C<sub>6</sub>H<sub>10</sub>CuO<sub>6</sub>, *cupric lactate*. Green to blue crystals. Readily sol in water; practically insol in alcohol.

USE: In dyeing baths, as mordant in printing woolen goods, solvent for water-insoluble dyes (alcohol-soluble induline, nigrosine, spirit-blue); reducing chromates in mordanting wool; manuf cheese, confectionery; acidulant in beverages; for acidulating worts in brewing, for removing *Clostridium butyricum* in manuf of yeast; dehairing, plump-ing, and decalcifying hides; solvent for cellulose formate; flux for soft solder; manuf lactates which are used in food products, in medicine, and as solvents; plasticizer, catalyst in the casting of phenolaldehyde resins. *Caution:* Caustic in concd solns.

THERAP CAT: Acidulant.

THERAP CAT (VET): Has been used as a caustic, and in dilute solutions to irrigate tissues; as an intestinal antiseptic and antiferment.

**5186. L-Lactic Acid.** (*S*)-2-Hydroxypropanoic acid; L-(+)-lactic acid; dextrorotatory lactic acid; d-lactic acid; sarcolactic acid; paralactic acid; Fleischmilchsäure; L-Milch-säure. C<sub>3</sub>H<sub>5</sub>O<sub>3</sub>; mol wt 90.08. C 40.00%, H 6.71%, O 53.29%. Occurs in small quantities in the blood and muscle fluid of man and animals. The lactic acid concn increases in muscle and blood after vigorous activity. L(+)-Lactic acid is also present in liver, kidney, thymus gland, human amniotic fluid, and other organs and body fluids. Obtained by resolution of DL-lactic acid: Purdie, Walker, *J. Chem. Soc.* 61, 754 (1892); Borsook *et al.*, *J. Biol. Chem.* 102, 449 (1933). Convenient laboratory prepn from glucose by fermentation by *Lactobacillus delbrueckii*: Brin, *Biochem. Prepn.* 3, 61 (1953). Prepn from hexoses using *B. dextralac-ticus*: Andersen, Greaves, *Ind. Eng. Chem.* 34, 1522 (1942). Monograph: M. Brin, R. H. Dunlop, "Chemistry and Metabolism of L- and D-Lactic Acids", *Ann. N.Y. Acad. Sci.* vol. 119, art. 3, 851-1165 (1965).



Crystals from acetic acid or chloroform, mp 53°. [ $\alpha$ ]<sub>D</sub><sup>25</sup> +2.6° (c = 2.5). pK at 25°, 3.79. Forms salts with many metals. The salts are more sol in water than the salts of the racemic acid. Most of the salts are levoratory.

Zinc L(-)-lactate dihydrate, Zn(C<sub>3</sub>H<sub>5</sub>O<sub>3</sub>)<sub>2</sub>·2H<sub>2</sub>O, prisms. [ $\alpha$ ]<sub>D</sub><sup>25</sup> -8.2° (c = 2.5 in water).

**5187. Lactic Acid Lactate.** 2-Hydroxypropanoic acid 1-carboxyethyl ester; 2-(lactoyloxy)propanoic acid; 2-(2-hydroxypropanoyloxy)propanoic acid. C<sub>6</sub>H<sub>10</sub>O<sub>5</sub>; mol wt 162.14. C 44.44%, H 6.22%, O 49.34%. Prepd by heating lactic acid at 120° for 10 hours: Dietzel, Krug, *Ber.* 58, 1307 (1925).

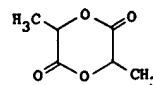


Pale yellow, clear, odorless oil. Sol in water and in the usual organic solvents.

Methyl ester, C<sub>7</sub>H<sub>12</sub>O<sub>5</sub>. Prepn: Claborn, U.S. pat. 2,371,281 (1945 to the people of the U.S.). bp<sub>760</sub> 107°; n<sub>D</sub><sup>20</sup> 1.4313.

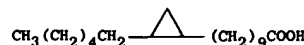
USE: The methyl ester as a solvent or plasticizer.

**5188. Lactide.** 3,6-Dimethyl-1,4-dioxane-2,5-dione; 2,5-dioxo-3,6-dimethyl-1,4-dioxane; 3,6-diketo-2,5-dimethyl-1,4-dioxane. C<sub>6</sub>H<sub>8</sub>O<sub>4</sub>; mol wt 144.12. C 50.00%, H 5.60%, O 44.40%. Formed by heating lactic acid at 180-220° *in vacuo* below 25 mm Hg. Also prepd by oxidation of esters of acetylenic  $\gamma$ -glycols: Brothman, Brit. pat. 671,449 (1952); U.S. pat. 2,663,715 (1953).



dl-Form, pale yellow cryst solid, mp 124° (commercial grades mp 96-104°); bp<sub>760</sub> 138-142°. Soluble in alcohol, ace-tone, some esters. Slightly sol in water, ether. Insol in petr ether, carbon tetrachloride. Hydrolyzes to lactic acid even in cold water.

**5189. Lactobacillic Acid.** (1*R*-cis)-2-Hexylcyclopropane-decanoic acid; 11,12-methyleneoctadecanoic acid; phyto-monic acid. C<sub>19</sub>H<sub>36</sub>O<sub>2</sub>; mol wt 296.48. C 76.97%, H 12.24%, O 10.79%. A lipid constituent of various microorganisms. Isola from *Agrobacterium tumefaciens*: Hofmann, Tausig, *J. Biol. Chem.* 213, 425 (1955). Structure: Hofmann *et al.*, *J. Am. Chem. Soc.* 80, 5717 (1958).

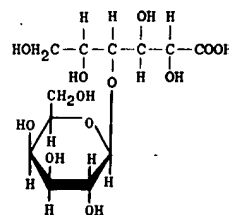


Crystals from acetone, mp 27.8-28.8°. Soluble in acetone, petr ether.

Methyl ester, C<sub>20</sub>H<sub>38</sub>O<sub>2</sub>, liq, bp<sub>760</sub> 187-187.5°. Soluble in many fat solvents.

Amide, C<sub>19</sub>H<sub>37</sub>NO, *lactobacillamide*. Crystals, mp 79.4-81.5°. Soluble in dimethylformamide.

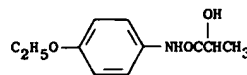
**5190. Lactobionic Acid.** 4-O- $\beta$ -D-Galactopyranosyl-D-gluconic acid; 4-( $\beta$ -D-galactosido)-D-gluconic acid. C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>; mol wt 358.30. C 40.22%, H 6.19%, O 53.59%. Ob-tained by oxidation of lactose: Fischer, Meyer, *Ber.* 22, 362 (1889); Ruff, Ollendorff, *ibid.* 33, 1806 (1900); Isbell, *J. Res NBS* 11, 713 (1933); Margariello, U.S. pat. 2,746,916 (1956 to Nat. Dairy Res. Labs.); Eddy, *Nature* 181, 904 (1958); Nishizuka *et al.*, *J. Biol. Chem.* 235, PC13 (1960).



Syrup. Freely sol in water, slightly sol in methanol, etha-nol, glacial acetic acid. Dehydration by distillation with dioxane yields *lactobionic  $\delta$ -lactone*, C<sub>11</sub>H<sub>20</sub>O<sub>11</sub>, non-deli-quescent crystals, dec 195-196°. Shows mutarotation. [ $\alpha$ ]<sub>D</sub><sup>20</sup> +53.0° initial (c = 8.8) - [ $\alpha$ ]<sub>D</sub><sup>20</sup> +22.6° final (240 minutes).

Calcium salt, C<sub>24</sub>H<sub>42</sub>CaO<sub>10</sub>, *calcium lactobionate*. Penta-hydrate, hairlike needles in brushlike groups. When anhydr, slender needles from small amts of anhydr ethanol. [ $\alpha$ ]<sub>D</sub><sup>20</sup> +23.7° (c = 6.28). n<sub>D</sub><sup>20</sup> 1.4583 (concd syrup just before crys-tallization). Freely sol in water.

**5191. p-Lactophenetide.** N-(4-Ethoxyphenyl)-2-hydr-oxypropanamide; p-lactophenetidide; lactyl-p-phenetidin-N-(p-ethoxyphenyl)lactamide; Fenolactine; Lactophenin; Phenolactine. C<sub>11</sub>H<sub>15</sub>NO<sub>3</sub>; mol wt 209.24. C 63.14%, H 7.23%, N 6.69%, O 22.94%. Prepn: Shapiro *et al.*, *J. Am. Chem. Soc.* 81, 6322 (1959).



Slightly bitter crystals from ethyl acetate + hexane, mp 117-118°. One gram dissolves in 330 ml cold, 55 ml boiling water, 8.5 ml alcohol; slightly sol in ether, petr ether.

THERAP CAT: Analgesic, antipyretic.

**5192. Lactose.** 4-O- $\beta$ -D-Galactopyranosyl-D-glucose; 4-( $\beta$ -D-galactosido)-D-glucose; milk sugar. C<sub>12</sub>H<sub>22</sub>O<sub>11</sub>; mol wt 342.30. C 42.10%, H 6.48%, O 51.42%. Present in milk

Consult the cross index before using this section.

Page 701

BEST AVAILABLE COPY